

Sub A

We claim:

1 1. A system for transferring information in a computer network from a
2 server to a client computer, the information including a plurality of hierarchically
3 related objects, wherein a viewable subset of the objects is displayed on a display
4 device connected to the client computer in the form of a navigable tree having
5 expandable nodes, the viewable subset being visible in a navigation pane on the
6 display device, the system comprising:

7 a tree descriptor array comprising information describing each of the objects
8 to be displayed in the navigation pane; and

9 a tree descriptor string comprising information describing a hierarchical
10 structure of expanded nodes in the tree;

11 wherein the tree descriptor array and the tree descriptor string are sent from
12 the server to the client computer; and

13 wherein the tree descriptor string comprises a list of only those said nodes
14 which are to be expanded and displayed on the display device.

1 2. The system of claim 1, further including:

2 a managed object list comprising an entry for each of a plurality of managed
3 objects in the navigable tree; and

4 a view list comprising a plurality of indicia of object data records, each of
5 which represents a child of one of the managed objects corresponding to an entry in
6 the managed object list;

7 wherein each said entry in the managed object list comprises indicia of an
8 entry in the view list.

1 3. The system of claim 2, wherein each one of the object data records
2 include information comprising:

3 a Universal Identifier for the object to which a given said one of the object
4 data records corresponds; and

5 a Universal Identifier for the parent of the object to which a given said one
6 of the object data records corresponds.

1 4. The system of claim 1, wherein the tree descriptor array comprises
2 information for each object in the subset of the objects to be displayed, including:
3 a Universal Identifier of the object;
4 a first index indicating the relative position of the object in the navigable
5 tree, at which a tree segment starts; and
6 a second index indicating the relative tree position of the object from its
7 managed object.

1 5. The system of claim 4, wherein the tree descriptor array further
2 comprises:

3 a first string indicating whether the object is expandable; and
4 a second string indicating whether the object is presently expanded.

1 6. The system of claim 1, wherein the tree descriptor string further
2 comprises a representation of the hierarchical structure of open containers in the part
3 of the tree that is being displayed.

1 7. The system of claim 6, wherein the tree descriptor string further
2 comprises indicia of the location of a cursor on the display device.

1 8. The system of claim 7, wherein the tree descriptor string further
2 comprises indicia of the state of nodes in the displayed segment of the navigation
3 tree including whether a node comprising a folder is open.

1 9. The system of claim 1, wherein the client computer uses information
2 in the tree descriptor string to render a view that includes one expanded said nodes.

1 10. The system of claim 9, wherein the client computer also uses
2 information in the tree descriptor array to render a view that includes said nodes
3 which are to be expanded.

1 11. The system of claim 1, wherein, in response to a user of the client
2 computer clicking on one of said expandable nodes, the client computer sends
3 information via the tree descriptor string to the server identifying the node to be
4 expanded.

1 12. The system of claim 1, wherein the list contained in the tree
2 descriptor string contains a list of those said nodes which are to be expanded and
3 displayed on the display device.

1 13. A system for transferring information in a computer network from a
2 server to a client computer, the information including a plurality of hierarchically
3 related objects, wherein a viewable subset of the objects is displayed on a display
4 device connected to the client computer in the form of a navigable tree having
5 expandable nodes represented by container objects, the viewable subset being visible
6 in a navigation pane on the display device, the system comprising:

7 a tree descriptor array comprising information describing each of the objects
8 to be displayed in the navigation pane; and

9 a tree descriptor string comprising information describing a hierarchical
10 structure of said container objects that are open;

11 wherein the tree descriptor array and the tree descriptor string are sent from
12 the server to the client computer; and

13 wherein the tree descriptor string contains a list of only those said container
14 objects which have been opened.

1 14. The system of claim 13, further including:

2 a managed object list comprising an entry for each of a plurality of managed
3 objects in the navigable tree; and

4 a view list comprising a plurality of indicia of object data records, each of
5 which represents a child of one of the managed objects corresponding to an entry in
6 the managed object list;

7 wherein each said entry in the managed object list comprises indicia of an
8 entry in the view list.

1 15. The system of claim 14, wherein each one of the object data records
2 include information comprising:

3 a Universal Identifier for the object to which a given said one of the object
4 data records corresponds; and

5 a Universal Identifier for the parent of the object to which a given said one
6 of the object data records corresponds.

1 16. The system of claim 13, wherein the tree descriptor array comprises
2 information for each object in the subset of the objects to be displayed, including:
3 a Universal Identifier of the object;
4 a first index indicating the relative position of the object in the navigable
5 tree, at which a tree segment starts; and
6 a second index indicating the relative tree position of the object from its
7 managed object.

1 17. The system of claim 16, wherein the tree descriptor array further
2 comprises:
3 a first string indicating whether the object is expandable; and
4 a second string indicating whether the object is presently expanded.

1 18. The system of claim 13, wherein the tree descriptor string further
2 comprises a representation of the hierarchical structure of open containers in the part
3 of the tree that is being displayed.

1 19. The system of claim 18, wherein the tree descriptor string further
2 comprises indicia of the location of a cursor on the display device.

1 20. A method for transferring information in a computer network from a
2 server to a client computer, the information including a plurality of hierarchically
3 related objects, wherein a viewable subset of the objects is displayed on a display
4 device connected to the client computer in the form of a navigable tree having
5 expandable nodes, the viewable subset being visible in a navigation pane on the
6 display device, the method comprising the steps of:

7 sending, from the client computer to the server, tree descriptor information
8 describing a hierarchical structure of the nodes that are to be expanded;
9 determining a tree segment to be displayed in the navigation pane in response
10 to the tree descriptor information received from the client computer; and

11 sending, from the server to the client computer, a list of each of the objects
12 in the tree segment to be displayed, and information describing each of the objects
13 to be displayed;

14 wherein said tree descriptor information comprises a list of only the nodes
15 that are to be expanded.

1 21. The method of claim 20, wherein said information describing each of
2 the objects to be displayed comprises information including:

3 a Universal Identifier of the object;
4 a first index indicating the relative position of the object in the navigable
5 tree, at which a tree segment starts; and
6 a second index indicating the relative tree position of the object from its
7 managed object.

1 22. The system of claim 21, wherein said information describing each of
2 the objects to be displayed further comprises:

3 a first string indicating whether the object is expandable; and
4 a second string indicating whether the object is presently expanded.

1 23. The system of claim 20, wherein the tree descriptor information
2 further comprises a representation of the hierarchical structure of open containers in
3 the part of the tree that is being displayed.

1 24. The system of claim 23, wherein the tree descriptor information
2 further comprises indicia of the location of a cursor on the display device.

1 25. The system of claim 24, wherein the tree descriptor information
2 further comprises indicia of the state of nodes in the displayed segment of the
3 navigation tree including whether a node comprising a folder is open.

1 26. The method of claim 20, further comprising the step of initially
2 sending, in response to a user of the client computer clicking on one of said
3 expandable nodes, information identifying the node to be expanded.

1 27. A method for transferring information in a computer network from a
2 server to a client computer, the information including a plurality of hierarchically
3 related objects, wherein a viewable subset of the objects is displayed on a display
4 device connected to the client computer in the form of a navigable tree having
5 expandable nodes, the viewable subset being visible in a navigation pane on the
6 display device, the method comprising the steps of:
7 generating a tree descriptor array comprising information describing each of
8 the objects to be displayed in the navigation pane;
9 generating a tree descriptor string comprising information describing a
10 hierarchical structure of expanded nodes in the tree; and
11 sending the tree descriptor array and the tree descriptor string from the
12 server to the client computer;
13 wherein the tree descriptor string comprises a list of only those said nodes
14 which are to be expanded and displayed on the display device.